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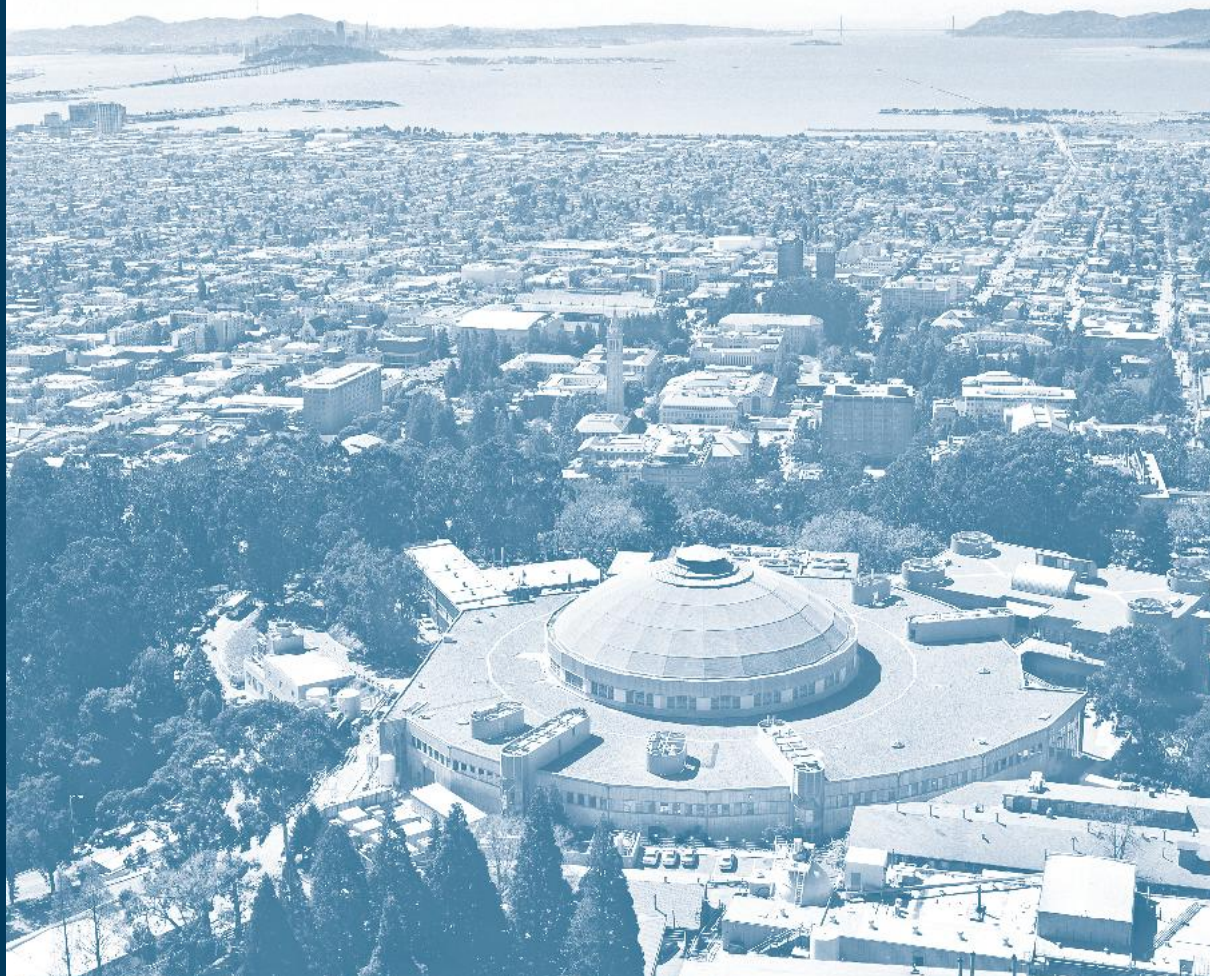
# Lawrence Berkeley National Laboratory

## ISO 50001 for US Commercial Buildings – Current Status and Opportunities

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Lawrence Berkeley National Laboratory

Energy Technologies Area  
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Contents

- Executive Summary..... 4
- 1. The Value of ISO 50001 for Commercial Buildings ..... 7
  - 1.1. What is ISO 50001?..... 7
  - 1.2. How Is ISO 50001 Different from Other Certification Programs?..... 7
  - 1.3. Benefits of ISO 50001 for Commercial Buildings ..... 8
    - 1.3.1. Direct benefits..... 8
    - 1.3.2. Expanded benefits ..... 9
- 2. Current ISO 50001 Certified Commercial Buildings ..... 10
- 3. Opportunities and Challenges for ISO 50001 in the Commercial Building Sector ..... 12
  - 3.1. Leveraging ISO 50001 Progress in the Industrial Sector ..... 12
  - 3.2. Unique Challenges and Opportunities in the Commercial Building Sector ..... 13
  - 3.3. Potential to Achieve and Sustain Deep Energy Savings Cost-Effectively ..... 13
  - 3.4. Buildings that Are Owned, Operated, and Occupied by Different Organizations ..... 14
- 4. Suitable Commercial Building Markets for ISO 50001 ..... 16
- 5. Scale ISO 50001 Quickly and Cost-Effectively with the Enterprise-Wide Approach..... 17
  - 5.1. What Is the ISO 50001 Enterprise-Wide Approach?..... 17
  - 5.2. Why Is the Enterprise-Wide Approach Cost-Effective? ..... 18
  - 5.3. Two Models for Implementing Enterprise-Wide ISO 50001..... 20
- 6. Keys to Successful Implementation for ISO 50001 ..... 21
- 7. Implementation Costs for ISO 50001 ..... 22
- 8. Implementation Resources for ISO 50001 ..... 23
- 9. Conclusions ..... 24
- 10. References ..... 25
- Appendix – Interviews with Two ISO 50001-certified Companies..... 28
  - Aflac (U.S. Insurance Company)..... 28
  - Hilton Worldwide (Global Hospitality Company)..... 32

## Executive Summary

*ISO 50001:2011 Energy management systems – Requirements with guidance for use* is a voluntary International Standard that provides organizations with a proven framework to manage energy and continuously improve their energy performance. Since its publication in 2011, the standard has been adopted in more than 20,000 certifications around the world according to the 2016 ISO Survey data. By 2016, there had been 47 certifications covering at least 180 U.S. sites. Most of the U.S. certifications are in the industrial sector, as industrial organizations strive to reduce manufacturing costs and promote good corporate social responsibility. The U.S. Department of Energy (DOE) promotes ISO 50001 as the state-of-the-art standard and framework for energy management in the United States.

Although the current ISO 50001 certifications mostly reside in the industrial sector, there is tremendous potential in the commercial building sector. The great value and potential in the commercial building sector is evidenced by several leading organizations such as Hilton Worldwide (Hilton), Aflac, JW Marriott, IBM, and Google adopting ISO 50001. The ISO 50001 certification differentiates from the other recognized commercial building “green” label certifications (e.g., LEED, ENERGY STAR) due to its requirements for continuous energy performance improvement based on a comprehensive and robust framework.

Beyond saving energy and improving the business bottom line, ISO 50001 conformance provides **two unique values**: (1) it helps an organization take a systematic approach to reach its energy/emission reduction goals, and (2) it institutionalizes the organization’s energy management practices so that they persist through personnel turnovers. The recognition of these values has transpired from our experience interacting with ISO 50001 certified organizations. In addition, ISO 50001 certification provides other significant non-energy benefits that are not frequently discussed or fully recognized in the commercial sector. Below are some examples:

- Leased commercial building spaces can potentially gain rental premiums.
- Publically traded companies can potentially increase their stock prices and access the growing socially responsible investment market.
- Companies exhibiting stronger corporate social responsibility tend to engage their employees and customers better.
- Companies with energy cost as a major operating cost can effectively manage risks associated with energy supply and cost, using a holistic approach.
- International organizations can remain compliant or ahead of energy/sustainability regulations in multiple countries.
- Institutionalized building energy management can help reduce tenant complaints, and hence free up operations and maintenance (O&M) resources.

Implementation of ISO 50001 in the commercial building sector presents unique opportunities and challenges in comparison with its implementation in the industrial sector. The energy footprint of a portfolio of commercial buildings can be just as significant as a large industrial facility. However, many energy-saving opportunities in commercial buildings can be addressed without capital investments, and the perceived risks for making energy improvements can be lower than in the industrial sector. In addition, the types of energy-consuming systems in commercial buildings are limited and have many similarities across buildings, which makes it much easier to standardize many ISO 50001-required

processes, procedures, and documents, which simplifies implementation. Sector-unique challenges include less familiarity with ISO systems and the certification process. The complexity in some buildings' ownership, tenancy, and O&M responsibilities also presents challenges. This report discusses these opportunities and challenges in detail.

This report also recommends the characteristics of organizations in the commercial building sector that can benefit the most from adopting the ISO 50001 standard—namely the “suitable market.” Eight segments (education, food sales, retail, inpatient health care, hospitality, office buildings, laboratories, and data centers) within the commercial building sector are highlighted for greater opportunities, because organizations in these market segments frequently meet the following characteristics:

- Either very large building(s) or a portfolio of smaller buildings (campus or distributed)
- Aggregated annual energy bill portfolio that approaches \$1 million or more
- A corporate or systemwide energy or sustainability goal and easy access to corporate resources
- A history of implementing an existing energy management program
- Clear chains of authority over key personnel who impact energy use
- Experience with other ISO standards (e.g., ISO 9001 or ISO 14001), which is preferred

The “enterprise-wide” approach recently has been proven to be very effective in scaling ISO 50001 across an entire organization and significantly reducing implementation costs, as compared to the traditional single-site implementation approach in a DOE pilot. This report summarizes why the enterprise-wide approach is cost-effective and how to implement it. Many commercial building organizations within the aforementioned suitable market tend to have a large number of small- to medium-sized buildings or sites, and the staff resources at each individual site that can be allocated to energy management are usually lean. This reality makes it imperative to streamline the implementation processes and reduce the cost per site. The enterprise-wide approach, which organizes the implementation effort around a “Central Office” with consolidated technical expertise, presents a great opportunity. This report discusses the experience learned from a DOE pilot and details about implementation options under this approach. The new DOE initiative, named “50001 Ready Program,”<sup>1</sup> also offers self-guided tools to help organizations implement an ISO 50001-conforming energy management system (EnMS) cost-effectively.

Organizations new to implementation of the ISO 50001 standard should pay special attention to several key factors to ensure success. The report provides estimates of the cost for implementing ISO 50001 in the commercial building sector, in terms of both internal labor requirements and external expenses. It is estimated, on a per building basis, that fewer than 0.5 full-time equivalent employees per year (FTE-yr) of internal staff resources, and between \$7,500 and \$9,000 of third-party certification cost, can be expected. That estimate is based on our interviews with experienced ISO 50001 and ISO 14001 auditors. Many organizations may already have assigned internal staff resources to perform various energy management tasks, so the ISO implementation resource estimate would represent a better-organized approach to their existing ongoing effort. Of course, these estimates will vary significantly depending on the organization, portfolio size, building complexity, implementation approach, and many other factors.

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<sup>1</sup> The official website for the “50001 Ready Program” is <https://betterbuildingssolutioncenter.energy.gov/50001Ready>

At the end of this report, we have summarized various useful implementation resources developed by DOE and its partners with the intent to assist organizations that would like to adopt the ISO 50001 standard for their energy management. In addition, two ISO 50001 pioneers in the commercial building sector, Aflac and Hilton, were interviewed, and the associated interview notes are included in the report's Appendix. Their motivations, implementation approaches, and experiences may be useful for other organizations as reference.

# 1. The Value of ISO 50001 for Commercial Buildings

## 1.1. What is ISO 50001?

*ISO 50001:2011 Energy management systems – Requirements with guidance for use* is a voluntary International Standard developed by the International Organization for Standardization (ISO). The standard provides organizations an internationally recognized “Plan-Do-Check-Act” framework to manage and improve their energy performance.

- Plan: Conduct the energy review and establish the baseline, energy performance indicators (EnPIs), objectives, targets, and action plans necessary to deliver results that will improve energy performance in accordance with the organization's energy policy.
- Do: Implement the energy management action plans.
- Check: Monitor and measure processes and the key characteristics of operations that determine energy performance against the energy policy and objectives, and report the results.
- Act: Take actions to continually improve energy performance and the energy management system (EnMS).

ISO 50001 does require continual energy performance improvement but it does not include prescriptive energy performance improvement goals. Rather, it provides a framework through which each organization can set and pursue its own goals for improving energy performance. By 2016, the standard had been adopted in more than 20,000 certifications worldwide, according to the ISO Survey data (ISO 2018). Among those, 47 certifications, covering at least 180 sites, are in the United States.

Other international standards developed by ISO that may be more familiar to commercial organizations include ISO 9001 (quality management) and ISO 14001 (environmental management). These ISO standards for management systems use the same “Plan-Do-Check-Act” management framework as the ISO 50001 standard. Note that the term “Energy Management Systems” in ISO 50001 is abbreviated as “EnMS”. It should be distinguished from the abbreviation of “EMS” for “energy management system,” which is often used in the commercial building sector interchangeably with the term “Building Automation System” or “BAS,” which refers to building supervisory and controls software applications.

## 1.2. How Is ISO 50001 Different from Other Certification Programs?

This study identified five U.S.-based energy and environmental building certification programs, to explore their similarity with ISO 50001. They are:

1. Green Globes – Existing Buildings
2. Green Globes – New Buildings
3. Green Seal
4. Leadership in Energy and Environmental Design (LEED): Building Design and Construction (BD+C)
5. LEED – Existing Buildings: Operations and Maintenance (O+M)

These five certifications do not require an energy management system or focus on continual energy performance improvement like the ISO 50001 certification does. For example, the United States Green



Building Council's (USGBC) LEED BD+C program addresses new constructions (since 1993) and is one of the most widely recognized building "green" certification programs in the United States. It rates and credits building designs on a matrix of energy and sustainability design considerations. However, it does not verify real-life operating energy performance after construction. The LEED O+M certification for existing buildings rewards O&M best practices that lead to using less energy, water, and other natural resources and a better indoor environment. LEED O+M tackles more aspects of a building's operation than energy efficiency, so its approach to energy management is not as focused and robust as the ISO 50001 standard's is.

Another popular building "green" certification program in the United States is the Environmental Protection Agency's (EPA) ENERGY STAR certification for existing buildings. It recognizes buildings that consume less energy per square foot of floor area than 75 percent of the similarly used buildings in the ENERGY STAR Portfolio Manager benchmarking database with weather normalization applied. Just like the other certification programs identified above, the ENERGY STAR certification does not require users to implement energy management systems or continuous energy performance improvement. However, ENERGY STAR offers guidelines<sup>2</sup> on building a strategic energy management program for buildings and plants. It uses a framework that is similar to the "Plan-Do-Check-Act" framework in the ISO 50001 standard, although the ENERGY STAR guidelines are less robust in their requirements and are not used for ENERGY STAR building certification purpose.

The international aspect of ISO 50001 is another differentiator that global organizations appreciate (see Section 0 for the interview with Hilton). It should be noted that ISO 50001 is not mutually exclusive with the other "green" programs (tools). Rather, they can complement one another because ISO 50001 serves as an overarching framework. It institutionalizes any good practices, including those promoted by LEED or other tools, and therefore expects increased use of these tools and sustained results.

### 1.3. Benefits of ISO 50001 for Commercial Buildings

ISO 50001 offers organizations a proven approach to develop an energy management plan that addresses critical aspects of energy performance—including energy use, measurement, documentation, reporting, design and procurement practices, and other variables affecting energy management that can be measured and monitored (DOE EERE, n.d.).

#### 1.3.1. Direct benefits

Following the energy management practices prescribed by ISO 50001 offers a number of benefits, which include, but are not limited to the following:

- Visible demonstration of social responsibility and strong support of sustainability goals
- Sustained commitment (participation and follow-through) of top management
- Documented processes and procedures that standardize energy management practices and help them to persist throughout personnel turnovers
- Continual energy and cost savings that improves business bottom line and competitiveness
- Staying compliant with or ahead of domestic and international energy/sustainability mandates

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<sup>2</sup> The ENERGY STAR Guidelines for Energy Management is found at <https://www.energystar.gov/buildings/about-us/how-can-we-help-you/build-energy-program/guidelines> (accessed on Apr 11, 2017).

- Increased awareness of energy consumption and focus of improvement effort by taking a system perspective rather than a project-level view
- Increased measurement that leads to data-informed operational and capital decision making
- Third-party verification adds credibility and transparency

Many organizations formally or informally interviewed by Lawrence Berkeley National Laboratory (LBNL) and DOE expressed that, after harvesting the “low-hanging fruits” through their energy management programs for many years, they found ISO 50001 to be an obvious next step for further meeting their organizational sustainability goals.

### 1.3.2. Expanded benefits

Besides the better-understood direct benefits mentioned above, there are important additional benefits associated with the adoption of ISO 50001, and these benefits are becoming better recognized by the industry and early adopters in the commercial building sector.

For building owners who lease or rent their properties, the financial benefits of increased operating income and asset value associated with a building’s “green” labels can be substantial. For example, a DOE study (Alschuler and Finch 2015) reviewed 58 existing studies, which have shown “green” labels (represented by LEED and ENERGY STAR) positively affect the financial performance of commercial buildings. The study found “green”-labeled buildings benefit from significantly higher rental rates (7 to 17 percent), occupancy rates (10 to 18 percent) and sales prices (6 to 31 percent) as compared to the non-rated buildings. They also pay much less for utility costs (at least 13 percent less) and only cost marginally more (about 2 percent) in construction costs. ISO 50001 has been very well promoted in Europe across commercial and industrial organizations through regulations and voluntary mechanisms; its adoption in the United States has been increasing as well. The recognition for ISO 50001 is growing, as an important sustainable approach to improving energy performance, and thus, a “green” label.

For publicly traded companies, demonstrating environmental corporate social responsibility (CSR) positively impacts their stock prices. The Massachusetts Institution of Technology Sloan School of Management published an event study (Flammer 2012) around the announcement of corporate news related to the environment for all U.S. publicly traded companies from 1980 to 2009. It found that companies reported to behave responsibly towards the environment experience a significant stock price increase. Energy footprint is directly linked with greenhouse gas (GHG) emissions, and is therefore recognized as one of the important metrics of today’s corporate sustainability and corporate citizenship. The ISO 50001 third-party certification gives transparency and additional credibility to the rigorous process and procedures that a company put in place to continuously improvement its energy performance and sustainability.

Publicly traded companies that demonstrate strong sustainability performance can also earn themselves greater access to capital in the rapidly growing socially responsible investment market (Urdangarin and VanderBeek 2015). One of the key drivers promoting the growth of this market is the Dow Jones Sustainability Indexes (DJSI), which was launched in 1999. This family of indices include the flagship DJSI World Index, which tracks the sustainability performance of the top 10 percent of the largest 2,500 companies listed on the Dow Jones Global Total Stock Market Index. Every year, RobecoSAM, a co-manager of DJSI, assesses and ranks the corporate economic, environmental, and social performance of the companies in question—and rejects those that are not operating in a sustainable and ethical manner

(Owen 2013). Companies are selected based on a defined set of criteria, which include corporate governance, risk management, branding, climate change mitigation, supply chain standards and labor practices (Wikipedia 2017). Shares of companies listed on one or more Dow Jones Sustainability Indices are recommended for sustainability investing (Urdangarin and VanderBeek 2015); both the investor community and the competing businesses take it seriously (Owen 2013). The ever-updating ranking list and evaluating criteria pressure companies to continually innovate in the areas evaluated. The two interviewed companies (see Appendix) are both DJSI-listed and have conveyed that they value the significance of being listed, although the specific benefits discussed were limited during the interviews to respect confidential business information.

ISO 50001 helps companies to address both climate change mitigation and risk management, and facilitates long-term innovation by providing a necessary continuous improvement framework. Many of the companies that have implemented ISO 50001 and are either U.S. based or have operation branches in the United States participate in RobecoSAM's annual Corporate Sustainability Assessment (CSA). For example, commercial companies like Hilton and Aflac and industrial companies like 3M, Cummins, Nissan, and Schneider Electric are all DJSI CSA participants who are ISO 50001 certified at the corporate level. Some expressed that it is critical not only to manage operating energy cost as a long-term risk, but also to be a leader in energy management and climate change mitigation, which plays an important role in engaging employees and customers. ISO 50001 provides a framework for tackling these issues.

Another important benefit of managing energy-consuming systems in commercial buildings is improved equipment operation controls and occupant comfort, both of which reduce system and equipment maintenance risks. Organizations like Aflac found that implementing ISO 50001 has significantly reduced the number of comfort complaints from occupants. As a result, the maintenance staff are more available to work on other priorities.

## 2. Current ISO 50001 Certified Commercial Buildings

ISO 50001 has been widely promoted in Europe through regulations and tax credits (e.g., in Germany). It is also becoming more recognized in the United States. So far, at least five globally well-known companies have achieved ISO 50001 certifications in more than 21 U.S. sites. They are summarized in Table 1. This number is not necessarily a comprehensive capture of all U.S. ISO 50001 certifications to date, since no mechanism exists to track them all. These five companies represented three business segments within the commercial buildings sector: hospitality, information technology (IT), and insurance.

Hospitality is sensitive to operating cost, which drives organizations in the sector to pursue ISO 50001, among other factors, such as corporate sustainability. The JW Marriott Washington D.C. hotel was the first hotel in the United States to achieve this certification in 2013 (Georgia Tech 2013). In the same year, the NH Hotel Group, a Spanish-based hotel chain, also achieved ISO 50001 certification for their global hotel management accommodation and restoration services, events, and conventions (DAkKS 2015). In 2014, Hilton Worldwide certified at the corporate (or "enterprise") level, covering more than 5,100 properties globally, including their U.S. properties (Hilton 2014). The Appendix includes a detailed interview with Hilton conducted by LBNL. Another international example is the Heritance Ahungalla

Hotel, a leading five-star resort in Sri Lanka. They found reducing energy cost to be very helpful in view of ever-increasing costs and energy supply limitations (Johnson et al. 2012).

**Table 1. Existing ISO 50001 Certifications with a U.S. Scope in the Commercial Sector**

Organization	Business	Scope	Initial Cert. Date	Cert. Body
Hilton	Hospitality	Entire global 4,200-plus properties; including (5) SEP sites	Sep 2014	DEKRA
Aflac	Insurance	Georgia Headquarters, 13 buildings	2013	SAI Global
JW Marriott	Hospitality	(1) SEP site	Sep 2013	DEKRA
IBM	IT	Corporate level, including (7) U.S. sites for R&D	Jun 2012	Bureau Veritas Certification
Google	IT	12 data centers globally, including (7) U.S. sites	2013	n/a

Note: SEP = Better Buildings Superior Energy Performance

Google and IBM have their own ISO 50001 certification scopes. Google certified 12 of its data centers globally in 2013, which includes seven in the U.S. (Walker 2013). The high energy operating cost in data centers is one of the important factors for this segment. IBM achieved their corporate-level certification in 2012 (Bureau Veritas Certification 2012), and that certification covers a number of global sites, including seven research and development (R&D) sites in the United States within the commercial buildings sector. There are other manufacturing sites under IBM's certification.

The insurance companies with an emphasis on CSR were also among the early adopters of ISO 50001. Aflac and Mutua Madrileña, a large Spanish insurance and property management company, are two examples. Aflac was the first U.S. insurance company to achieve this certification, which covers 13 buildings on their headquarter campuses. DOE conducted an interview with Aflac about their ISO 50001 effort, and the interview notes are included in the Appendix. Mutua Madrileña certified 14 buildings in Madrid, Spain, in 2015. The company has saved more than 0.4 million euros, or 18.4 percent of total energy costs, in two years after certifying to ISO 50001 without much capital investment (Mutua Madrileña 2016).

Another international example is University College Cork, in Ireland. It was the first university in the world to achieve ISO 50001 certification (Johnson et al. 2012). The university has been implementing energy improvements for over 20 years, but pursuing ISO 50001 gave energy management a much higher visibility and profile. Note that the above-mentioned organizations with ISO 50001 certified commercial buildings are results of an uncomprehensive web search, since a complete list of certified organizations is not available for reference.

### 3. Opportunities and Challenges for ISO 50001 in the Commercial Building Sector

The commercial building sector has the potential to benefit significantly from ISO 50001, although unique barriers must be addressed to achieve success. Here, we compare it to the industrial sector to understand the opportunities and challenges in the commercial building sector.

#### 3.1. Leveraging ISO 50001 Progress in the Industrial Sector

Since the release of the ISO 50001 standard in 2011, its adoption in the United States has been primarily in the industrial sector, where its use continues to grow. There are a few reasons why the industrial sector was very well suited for ISO 50001, and these have become evident from engaging with certified companies:

- The energy consumption is very intense, and energy cost is significant to business competitiveness in certain industry segments.
- Organizations typically own their facilities and are responsible for their own energy bills, which motivates them to manage energy cost as a business risk.
- Most larger industrial organizations are regulated for environmental impact, including GHG emissions, and sometimes they already have an energy program in place.
- Many organizations have experience with another ISO or similar standard, such as ISO 9001, ISO 14001, and OHSAS 18001. They are familiar with the Plan-Do-Check-Act management framework and documentation requirements.
- Organizations typically have a clear structure and line of authority over personnel who have impact on energy use, which enables streamlined implementation and resource availability once top management is committed.

Besides the natural market adoption of ISO 50001, DOE has been promoting ISO 50001 as part of its Better Buildings Superior Energy Performance (SEP) certification program and 50001 Ready program in North America (primarily in the United States). The program requires third-party verified energy savings at certain levels, in addition to a certified ISO 50001 energy management system. Up until now, participants in the SEP program have been industrial sites, with the exception of five Hilton hotels and one JW Marriott hotel.<sup>3</sup> To support the SEP program, DOE provides a number of tools and resources, many of which are useful to organizations looking to implement ISO 50001. See Section 8, Implementation Resources for ISO 50001, for details.

DOE has published case studies that illustrate implementation of ISO 50001 and SEP at both individual sites and enterprise-wide. The enterprise-wide approach to implementing ISO 50001 makes sense for both commercial organizations and industrial organizations with commercial buildings (see Section 5, Scale ISO 50001 Quickly and Cost-Effectively with the Enterprise-Wide Approach). The implementation

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<sup>3</sup> SEP-certified facilities are found on the DOE Office of Energy Efficiency & Renewable Energy (EERE)'s website <https://www.energy.gov/eere/amo/certified-facilities> (accessed on Apr 4, 2017).

models and strategies are captured in DOE's Enterprise-wide Accelerator case studies<sup>4</sup> and a summary paper (Liu et al. 2017).

In addition, the Clean Energy Ministerial offers resources through the Energy Management Working Group to promote ISO 50001 internationally. There are numerous case studies of international organizations implementing ISO 50001 at corporate level or at individual sites.<sup>5</sup> These resources help commercial organizations build their business case, understand cost and benefits, and evaluate implementation models and strategies.

### 3.2. Unique Challenges and Opportunities in the Commercial Building Sector

In comparison with the industrial sector, the commercial building sector has its opportunities and challenges, based on the authors' experience in both sectors:

- The energy consumption and cost for a single building is usually relatively small compared to an industrial facility. However, the energy consumption of a campus or portfolio of distributed buildings can be just as substantial as an industrial facility. In addition, there are high-energy-intensity commercial buildings segments, such as data centers and laboratories.
- There are various building ownership options for building operations and energy bills in the commercial sector. The key is to consider carefully the control and influence with building operator and tenants who affect the energy use when defining the scope and boundaries of the ISO 50001 EnMS.
- Many commercial building organizations are less familiar with energy management concepts and strategies. However, because the types of energy systems and equipment in commercial buildings have many commonalities across the sector, there is great opportunity to take advantage of established best practices, procedures, tools, and templates.
- Many commercial organizations have no previous experience with ISO management standards. However, as mentioned above, sharing a standard set of procedures that constitute an ISO 50001 EnMS with limited customization can make sense for many organizations, and significantly reduce the required implementation effort.
- Sometimes the personnel who affect the energy use of a commercial building or portfolio of buildings belong to multiple organizations with a line of authority within each of them. These organizations do not necessarily communicate with each other beyond the basic business needs. In addition to the aforementioned scope of EnMS considerations, it is important to align priorities among the top management of all involved organizations to ensure resources are available and results can be achieved.

### 3.3. Potential to Achieve and Sustain Deep Energy Savings Cost-Effectively

Many energy performance improvements in commercial buildings can be achieved without capital expenditures, through operational, behavior, and maintenance-related changes. One good example is

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<sup>4</sup> These case studies can be found at <https://www.energy.gov/eere/amo/business-case-iso-50001-and-sep#case-studies> (accessed on Oct 28, 2017).

<sup>5</sup> Clean Energy Ministerial case studies are found at <http://www.cleanenergyministerial.org/publication-cem> (accessed on May 11, 2018.)

existing-building retro-commissioning, which is already well-recognized in the U.S. commercial building sector. Researchers at LBNL examined 332 existing buildings in 26 states and concluded that retro-commissioning delivered 16 percent of weather-normalized whole-building energy savings with 1.1 years simple payback and at a median cost of \$0.30/square foot (ft<sup>2</sup>) (Mills 2009).

However, researchers (Toole 2010; Friedman et al. 2002; Bourassa et al. 2004) have reported that the energy savings from retro-commissioning degrades over time. Some reasons identified for savings degradation include (1) limited operator support and operator turnover, (2) poor information transfer from the commissioning process, and (3) lack of systems to help track performance. The ISO 50001 framework provides an excellent opportunity to address all of the above issues leading to energy savings degradation. The discipline that the ISO 50001 standard requires for competence and training, documentation, operational control, and regular energy reviews will effectively help performance improvements persist and continue.

Besides retro-commissioning, there are plenty of other cost-effective energy-saving opportunities in commercial buildings. Even for performance improvement measures requiring capital expenditures, the payback of these measures can make them an attractive business decision. An investment in energy performance improvement with a five-year payback period outperforms 7 percent compounding interest in under 10 years. This does not account for the ancillary benefits of the improvement (e.g., increased occupant comfort, increased rent), future increases in energy prices, non-investment efficiency improvements, or lower interest rates, all of which will further increase the value of the efficiency improvement.

One important advantage the commercial building sector has in achieving deep energy savings is that the perceived risks for implementing energy improvement actions are generally fewer than in the industrial sector. In the industrial environment, concerns about the impact on product quality, production schedule, throughput, and environmental regulation compliance from energy projects are common. Often, these concerns can stop projects that would otherwise be implemented. These concerns are usually not a problem in commercial buildings, since most energy-consuming systems are serving occupant comfort (with the exception of certain types of buildings, such as data centers and laboratories).

ISO 50001 certified EnMS has helped commercial building organizations achieve very significant energy savings, including those with a long energy management history. For example, Aflac has saved 16.7 percent energy consumption per square foot over four years, which is on top of a deep 40 percent reduction before they embarked on the ISO 50001 journey. To enable more organizations to benefit from ISO 50001, a new DOE initiative named “50001 Ready Program” was rolled out to help reduce the cost of its implementation. This initiative offers a no-cost, self-guided approach to implementing the standard, and can be a great option for small- to medium-sized organizations.

### 3.4. Buildings that Are Owned, Operated, and Occupied by Different Organizations

In the commercial building sector, it is common that the building owners lease or rent their properties and hire service companies to manage, operate, or maintain different aspects of those properties. Therefore, there are often multiple organizations associated with one particular building, which adds complexity to managing the building’s energy. Implementing ISO 50001 in such scenarios breaks new

territory because little discussion or experience is publically available. To explore a viable model for implementing ISO 50001 in these buildings, we need to examine the parties who influence their energy use.

In a commercial building setting, there are generally two categories of energy consuming assets—(1) the building mechanical, electrical, and plumbing (MEP) systems, which serve the basic functionalities of the building; and, (2) plug-in loads and appliances serving particular purposes for the tenants. The MEP systems are typically owned by the building owner and operated and maintained by professionals from contractors’ organization, but the lighting systems and distributed, small HVAC equipment (e.g., small air conditioners and heat pumps) are often operated by tenants. Even for large central systems operated by professionals, the tenants will influence the energy consumption within the provided limits of adjustment for their own comfort.

On the other hand, the tenants often purchase and own the consumer appliances (e.g., office appliances), although in certain segments, such as hospitality, the building owner typically owns the appliances. The maintenance responsibility of these appliances usually coincides with their ownership, although service by manufacturers are typically available for all major appliances. The tenants usually operate these appliances regardless of their ownership. Table 2 summarizes these scenarios.

**Table 2. Parties that Own, Operate, and Maintain Energy-Consuming Systems in Leased or Rented Commercial Buildings**

Parties	Ownership	Operation	Maintenance	Example
<b>Building MEP Systems</b>				
Building Owner	P			
Contractor		P	P	
Tenant		S		Lighting; distributed small HVAC equipment
<b>Consumer Appliances</b>				
Building Owner	S	S	S	Hotels
Manufacturer			P	Major appliances
Tenant	P	P	S	Most leased

Note: “P” indicates that the designated party is primarily associated with a certain function; “S” indicates that the designated party is secondarily associated with a certain function. “Primary” and “Secondary” refer to more frequently and less frequently seen scenarios, respectively, among leased/rented commercial buildings.

When setting the scope and boundaries of an ISO 50001-conforming energy management system, it is important to recognize how different parties interact with these energy-consuming assets in the building(s). MEP systems typically represent a majority of a building’s energy consumption in leased and rented buildings. Therefore, the building owner should own the ISO 50001 EnMS associated with a



building considering that they ultimately decide what to do with these assets (i.e., the MEP systems and equipment). Since the operation and maintenance of MEP systems for leased and rented buildings are typically contracted out, the contractor(s) should be included in the EnMS, especially in the areas of operational control and competence, training, and awareness. Considering their knowledge of these systems and equipment, the contractors should also be closely involved in the energy planning process (including energy review), as well as design and procurement as appropriate. Tenants not only influence energy consumption of the MEP systems but also own and operate most of the consumer appliances, which contribute to the building's plug load. The building owner typically does not have control over the tenants' energy-consuming behavior beyond agreed-upon policies in the lease. However, building owners can influence tenants' behavior in a more desirable direction through awareness training. There are also technologies available that allow centralized control to promote energy-efficient settings (e.g., light levels and cooling and heating set points) and limit tenants' abilities to make adjustments on the MEP systems. Tenants' consumer appliance purchasing and operating decisions typically reside entirely within their organization. These appliances not only directly consume energy during operation, but also present cooling loads to the building HVAC systems. Therefore, building owners should engage tenants in training for both energy awareness and EnMS, so the tenants can understand and support the EnMS objectives and targets with desirable behavior.

In summary, we recommend that in leased and rented commercial buildings, the building owner's organization should own and implement the ISO 50001 EnMS, although service companies or consultants may be hired to draft documents for the owner. If contractors are used for building O&M, they should be engaged in the development and implementation of the EnMS so they understand and commit to their roles and responsibilities. These expectations should then be included in the O&M contracts. To obtain best results, tenants (especially those under longer leases) also should be included in EnMS awareness and training. It may not be always practical to engage all the tenants to the same extent, and some tenants may have greater impact on energy consumption than others. Therefore, the owner can be selective about which tenants (or types of tenants) to include in the EnMS scope and/or to what extent each tenant (or type of tenant) will be included in EnMS awareness and training. On the other hand, if the tenants' organization is ISO 50001 certified or compliant but rent their space, they can review their energy consumption by collecting data from the property owner or the utilities. They can also potentially manage and improve their energy performance through space procurement, which is an important aspect in ISO 50001. Although this approach has not been tested, it could potentially promote ISO 50001 adoption and general building energy efficiency similar to the supply chain and brand standard approaches.

#### 4. Suitable Commercial Building Markets for ISO 50001

ISO 50001 can be of value to any organization with an energy footprint and is designed with great flexibility to accommodate the circumstances of various organizations. However, certain segments within the commercial building sector may receive a bigger "bang for the buck" with ISO 50001 implementation. As a rule of thumb, organizations with a total energy bill greater than \$1 million per year are recommended for ISO 50001 certification.

We have identified the following eight segments within the commercial sector that may represent the greatest market potential for adopting ISO 50001. This is because they tend to have a portfolio of

buildings of greater than 50,000 ft<sup>2</sup>, with higher energy costs and centralized equipment. In most cases (except for office buildings), they are also responsible for their own energy bills, which motivates them to save energy.

1. Education – college campuses
2. Food sales
3. Retail – excluding malls
4. Inpatient health care
5. Hospitality
6. Office buildings
7. Laboratories
8. Data centers

In addition, organizations with corporate energy or sustainability goals tend to find ISO 50001 more valuable, because it provides a structured approach to meeting these goals. Especially those organizations with an existing energy program that has harvested the “low-hanging fruits” will find it imperative to implement ISO 50001, to enable them to take their effort to the next level. The two companies interviewed and covered in this report are examples of such organizations. ISO 50001 is also particularly suitable for multi-site, including multi-national, organizations (see Section 5, Scale ISO 50001 Quickly and Cost-effectively with the Enterprise-wide Approach) to incorporate into their corporation standards. For corporations wanting to push energy management to their managed and franchised properties or through the supply chain, adopting the standard can be very effective. It also combines well with other international standards such as ISO 9001 and ISO 14001.

The lessons learned from an earlier DOE commercial building ISO 50001 pilot (Deru, Field, and Punjabi 2014) suggests that organizations with experience implementing other ISO standards (e.g., ISO 9001 or ISO 14001), greater access to corporate resources, and clear chains of authority over personnel who affect energy use are more likely to successfully implement ISO 50001.

Another unique market in the commercial building sector is the commercial building properties market of an industrial organization already considering or implementing ISO 50001. The effort of including additional commercial buildings in their ISO 50001 scope with necessary adjustments is significantly less effort than creating a new EnMS. This proposition makes sense to many industrial organizations like 3M, which is advancing in this direction.

## 5. Scale ISO 50001 Quickly and Cost-Effectively with the Enterprise-Wide Approach

### 5.1. What Is the ISO 50001 Enterprise-Wide Approach?

ISO 50001 can be implemented using an “enterprise-wide” approach, where multiple sites share a common ISO 50001 EnMS managed by a “Central Office.” This approach promotes consistency, leverages resources, promotes best practice sharing, facilitates realization of economies of scale, and accelerates system adoption. Though each site must comply with the EnMS procedures put in place at the Central Office, the program is flexible enough to accommodate site-specific circumstances. Under

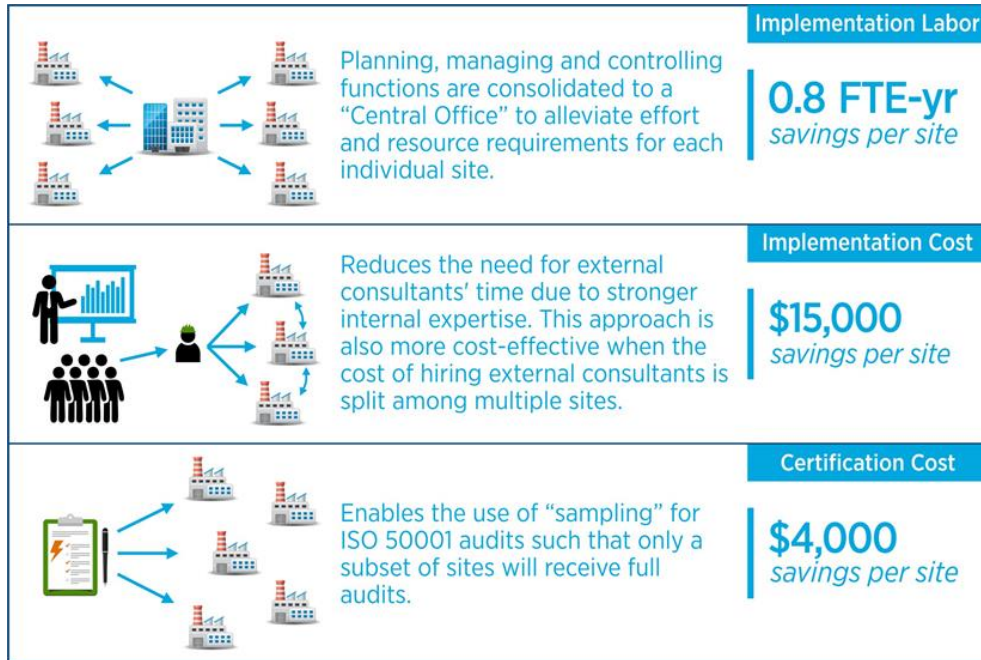
this approach, an ISO 50001 third-party audit will take place at the Central Office level and allow for a subset of all prospective ISO 50001 sites to be audited, a process known as “sampling.” The enterprise-wide approach streamlines EnMS implementation, making the process more cost-effective per site (Liu et al. 2017).

The enterprise-wide approach to implementing ISO 50001 has been proven to be feasible and effective by many organizations, including Hilton and four industrial companies: 3M, Cummins, Nissan, and Schneider Electric. This approach will be very important for the commercial building sector because many organizations have multiple or even a large number of distributed locations. The energy footprint of each site may be significant enough to justify dedicating staff to energy management; however, the organization’s total energy footprint may be very large, and the corporation may be willing to dedicate central resources to energy management. For example, university/college systems, government agencies, chains of retail stores, restaurants, hotels, and hospitals are such candidates. Real estate companies owning a portfolio of different types of buildings also could be good candidates for implementing enterprise-wide ISO 50001.

## 5.2. Why Is the Enterprise-Wide Approach Cost-Effective?

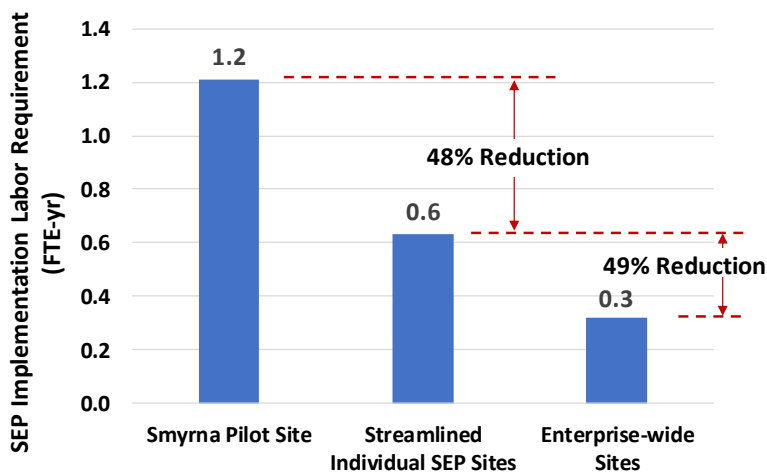
The enterprise-wide approach to ISO 50001 and SEP certification increases energy savings while reducing the level of effort and implementation costs at each site. The four industrial companies partnered in the DOE SEP Enterprise-wide Accelerator pilot—3M, Cummins, Nissan, and Schneider Electric—used this approach to implement ISO 50001 at 30 sites in North America and certified them to SEP. These four companies had previous experience with ISO management systems (e.g., ISO 14001) and had finished one or more ISO 50001/SEP pilot sites when they adopted the enterprise-wide model. The resulting energy performance improvements saved \$18.9 million of annual energy costs in total. On average, these 30 sites improved energy performance by 5 percent annually under their SEP certifications, saved more than \$600,000 annually in energy costs, and reduced implementation costs for ISO 50001 and SEP by \$19,000 of external costs and 0.8 full-time equivalent per year (FTE-yr) of internal staff time per site (Figure 1). Under the enterprise-wide approach, ISO 50001/SEP implementation at these companies typically took between 4 to 18 months at each site, which required 0.3 to 1.7 FTE-yr of internal labor plus \$18,000 to \$34,000 of external costs per site (DOE EERE 2017).

Please note that the above internal labor requirement and external cost figures are based on the experience of four industrial companies, which will be different from what the commercial building sector is expected to experience. Section 7, Implementation Costs for ISO 50001, will examine the estimated labor and costs for commercial buildings more closely.



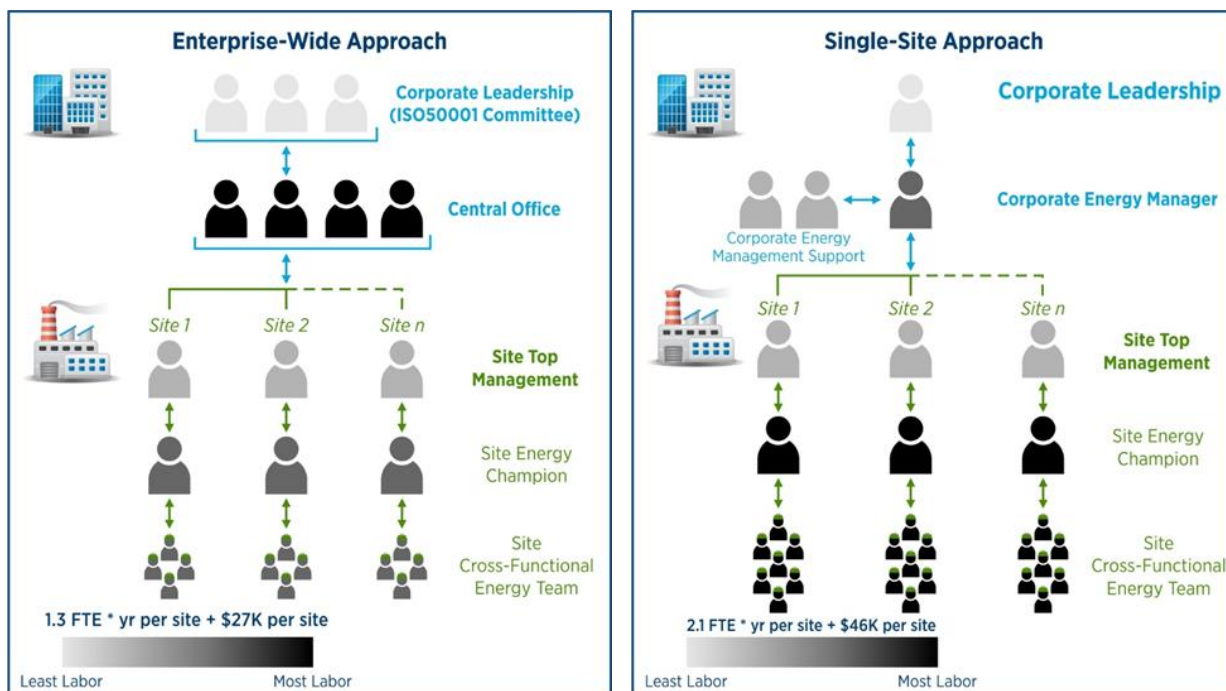
**Figure 1. The Enterprise-wide Approach Saves ISO 50001/SEP Implementation Resources Three Ways**

As an organization gains experience with ISO 50001 and SEP, the labor requirement for implementation decreases by each additional site. The Enterprise-wide Accelerator approach using a Central Office reduces costs beyond what the normal learning curve can achieve—once the organizational structure is established, processes and procedures are developed, and experts are identified, the deployment at additional sites becomes much faster and cheaper. For example, Schneider Electric was able to bring down the per-site implementation labor in two major steps, by almost half in each step, since their first pilot site (Figure 2).



**Figure 2. Trend of Schneider Electric’s Internal Labor Use for Implementing SEP**

The four Accelerator partner companies have each established their own ISO 50001 enterprise team structures with many commonalities. Figure 3 (left) shows a generic organizational structure that can be used for the enterprise-wide approach. It addresses top management at two levels: corporate and site. The Central Office is directed by the corporate top management and oversees the ISO 50001 enterprise program across sites. Each site has an energy champion leading the local program with support from a cross-functional team. Figure 3 (right) shows a structure typically used for the traditional, single-site ISO 50001/SEP approach. It is clear that the enterprise-wide approach reduces the resource requirement per site and, hence, is much more cost-effective.



Note: The numbers of sites and team members are depicted for illustration purposes; actual numbers may vary by organization.

**Figure 3. ISO 50001 Organization Structure Requires Fewer Staff Resources per Site under the Enterprise-wide Approach (Left) than It Does under the Single-site Approach (Right)**

### 5.3. Two Models for Implementing Enterprise-Wide ISO 50001

The DOE’s SEP Enterprise-wide Accelerator pilot identified two different implementation models for enterprise-wide ISO 50001: a “site-centric” model and a “core-team” model (Liu et al. 2017).

The site-centric model relies on site staff to implement ISO 50001 with guidance and assistance from the Central Office. As seen in how industrial organizations (e.g., 3M and Cummins) adopted this approach, a team of 5 to 10 people is typically used, and implementing ISO 50001 and additional components of SEP (regression modeling and achieving certified performance improvement level) required about 1 FTE-yr per site under this approach. This model could work for a commercial building complex or campus, where the large facility size and energy footprint warrants an onsite facility manager and even an energy/utility/sustainability manager. The facility is also likely to have its own maintenance and

engineering crew, although some organizations may contract this service out. The benefits of this model include input from a wide range of personnel, continued buy-in from the included parties, and enriched EnMS knowledge and expertise at the site. If the energy footprint of each site is large enough, the higher staff resource requirement can be justified to encourage the site to own the EnMS. Under this model, the site can tailor the EnMS to its needs while being able to keep the labor requirement per building low (in a campus scenario, for example).

The core-team model relies on a small, centralized team (from the Central Office or hired consultants) to perform certain key ISO 50001 implementation tasks and help establish the sites' EnMS. Industrial organizations like Nissan and Schneider Electric chose this model because it required much fewer site staff resources (typically 3 to 5 staff members on the site team). The site energy teams focused on integrating the EnMS with existing management systems such as ISO 14001, training, and internal and third-party audits. Energy reviews and customizing operating procedures were largely completed by the Central Office core team. Compared to the site-centric model, the core-team model significantly reduces training for site staff and more readily leverages the experiences from previous sites. The result was lower labor requirements—about 0.3 to 0.4 FTE-yr per site, including both the site team and the core-team staff. In addition to the fewer number of staff members for implementation, this model also promotes consistency and best practices across all sites. The core-team model is suitable for commercial building organizations with many geographically distributed sites of smaller energy footprints. These sites typically do not have a local facility manager or maintenance and engineering staff. However, the corporate portfolio of these organizations can be very large, and has full-time energy/utility/sustainability manager(s) and energy management initiatives. To implement enterprise-wide ISO 50001, the corporate office can provide a team of Central Office experts to create corporate energy procedures, tools, and trainings for the sites. They can also perform the energy analysis and energy review for the site as appropriate. The sites can then easily customize and implement the EnMS by allocating a small staff resource.

Section 4, Suitable Commercial Building Markets for ISO 50001, noted that multiple segments within the commercial building sector suitable to adopt ISO 50001 fall in the category of “many, geographically distributed sites of smaller energy footprints.” As stated in that section, energy-consuming systems in commercial buildings are limited in types and tend to have many similarities across buildings. Therefore, it makes sense for many commercial building organizations to develop a corporate energy manual or a set of standard operating procedures at the Central Office and allow the individual sites to customize those procedures as needed. It is also plausible for the corporate organization to standardize and disseminate information about energy management best practices for the same reason. Therefore, given the generally lean facility staff resources in commercial buildings, the “core-team” model will likely to be the most suitable model for the commercial building sector. However, these two models above are not mutually exclusive, and hybrid models are possible. For example, when the sites of an organization have very different building types, and/or the cultures and management structures at different sites vary dramatically, then the “site-centric” model can be useful.

## 6. Keys to Successful Implementation for ISO 50001

Experience from the DOE pilot (Deru, Field, and Punjabi 2014) has shown that commercial building organizations are usually very thin on staff resources, which dictates that implementation efforts be well

prioritized and focused to ensure success. ISO 50001 requires that significant effort be invested in keeping documents and records. For organizations unfamiliar with documentation, filling the large gaps can quickly consume staff resources and become overwhelming before tangible results are evident. In this situation, the implementation team can lose momentum and, in worst case, even lose support from the top management. Therefore, it is important to take the following steps:

1. Obtain formal commitment from top management upfront to ensure resource allocation with competing priorities, and keep management regularly involved.
2. Choose an appropriate scope for the EnMS and its components, such that it is reasonably achievable (for example, there are many requirements to meet for each “Significant Energy Use (SEU)” identified; therefore, it would be advisable to start with one or two SEUs and expand over time as resources allow).
3. Have a clear understanding of what is required by the ISO 50001 standard to avoid unnecessary “overachieving” and to manage expectation of the team.
4. Use working sessions to have the team (ideally in the same room) working on deliverables together, such as reviewing draft documents.
5. Implement the EnMS processes and procedures as they are developed, such that the team and management can see some “early wins.”
6. Leverage available templates, examples, and technical assistance as much as possible (see Section 8, Implementation Resources for ISO 50001) to avoid “re-inventing the wheel” and use project management/team collaboration tools as appropriate.
7. Use the enterprise-wide approach if appropriate: develop and implement the core elements of the ISO 50001 standard first at a pilot site, which ideally would have more energy management experience and available resources than other sites, and then expand it to additional sites.

EnMS defines how an organization would manage energy, which affects a very wide employee basis. Therefore, its development should not be the effort of a single individual. Rather, a cross-functional team should be used to ensure wider buy-in, which is critical for sustainable results. The EnMS Management Representative who leads the implementation can make individual assignments to his team members and check in regularly for progress, and leverage regular group meetings as working sessions to complete implementation tasks as a team. The latter has been found to be more effective with some organizations in the earlier DOE commercial building ISO 50001 pilot.

## 7. Implementation Costs for ISO 50001

Implementation of ISO 50001 includes both internal and external costs. “Internal costs” refers to the personnel resources required to develop and implement ISO 50001 requirements, which will vary by organization. “External costs” will include, at minimum, third-party certification cost. However, it can also include external training or consultant costs if the organization chooses to use them. Some organizations may consider increasing their data availability for more robust energy review by adding metering equipment, including hardware and/or software. This type of investment is not required by ISO 50001, although it can facilitate implementation and enhance results.

Because there are only a few ISO 50001 certified commercial buildings today, the data points of true implementation costs in the commercial sector are very limited. It has been estimated that fewer than

0.5 full-time equivalent worth of internal staff resources over a year (FTE-yr) is required to implement SEP (including ISO 50001) at a single commercial building. This estimate was based on a leading certification body, DEKRA's experience in a typical implementation effort of ISO 9001 / ISO 14001, and comparing the implementation requirements of ISO 50001 with the other two ISO standards. Of course, many factors can affect the resource requirement for a given building, such as its size, scope of EnMS, staff's previous experience with energy management or ISO standards, and other factors. It should be noted that, the more buildings are included in the EnMS, the less it typically costs per building for an organization to implement ISO 50001, especially when the enterprise-wide approach is used (see Section 5.2, Why Is the Enterprise-Wide Approach Cost-Effective?).

Therkelsen et al. (2015) showed that an average of 0.8 FTE-yr of internal labor can be expected when single-facility SEP (including ISO 50001) pilots are implemented in the industrial sector. In addition, when industrial organizations take an "enterprise-wide" approach (see Section 5.1, What Is the ISO 50001 Enterprise-Wide Approach?), a lower internal staff resource requirement between 0.3 and 1.7 FTE-yr can be expected (Liu et al. 2017). Considering that there are typically more energy sources and energy systems at industrial facilities than at commercial buildings, the expected effort for energy review will be significantly less. In addition, energy systems in commercial buildings are much more similar to one another, as compared to the industrial sector. Therefore, when ISO 50001 is implemented at a portfolio of commercial buildings at an organization, once the EnMS is established at one building, the expected effort to expand it to additional buildings will be incremental. In other words, the commercial building sector holds much greater opportunity to achieve economies of scale in adopting ISO 50001. The implementation costs will also decrease as the market matures and more tools and resources for implementation become available. The DOE's 50001 Navigator is a good example.

We have estimated that the third-party certification cost will be between \$7,500 and \$9,000 for a single building and lower per building for a portfolio. This is again assuming that it takes less effort to implement and certify ISO 50001 in commercial buildings than in industrial facilities, for the reasons stated above. The cost for third-party certification for single sites in the industrial sector has averaged \$17,000 in the United States (Therkelsen et al. 2015). And when industrial organizations took the enterprise-wide approach with multiple sites certified simultaneously, the third-party costs per site came down to \$12,000–\$14,000 (Liu et al. 2017). The U.S. industrial organizations have heavily relied on hiring consultants for training and implementation guidance, the cost of which is reflected in the aforementioned cost figures. With the DOE 50001 Ready Program, organizations now have the opportunity to reduce implementation costs by taking a self-guided approach using the DOE tools (such as the 50001 Ready Navigator and EnPI Lite, discussed below).

## 8. Implementation Resources for ISO 50001

A number of resources are available on the DOE Energy Efficiency and Renewable Energy (EERE) and its partners' websites for assistance with the implementation of ISO 50001 and SEP on both a single-site and an enterprise level. These include the following:



- Getting started with 50001:<sup>6</sup> A basic introduction of the ISO 50001 Plan-Do-Check-Act framework and associated steps.
- 50001 Ready Navigator tool:<sup>7</sup> The 50001 Ready Navigator is an online resource that provides step-by-step guidance to implementing an energy management system according to the principles of ISO 50001. Helpful resources available in the Navigator include templates, checklists, and examples.
- EnPI Lite Tool:<sup>8</sup> EnPI Lite is a user-friendly companion online resource to the 50001 Ready Navigator for regression-based energy performance modeling.
- Energy Performance Indicator (EnPI) tool:<sup>9</sup> Similar to EnPI Lite, it is an Excel-based regression analysis tool which helps facility and corporate managers establish a normalized baseline of energy consumption, track annual improvement progress, energy savings, SEP EnPIs, and other variables.
- Energy Footprint Tool:<sup>10</sup> This tool can help manufacturing, commercial and institutional facilities track their energy consumption, factors related to energy use, and significant energy end use.
- Energy Review Tool:<sup>11</sup> This tool, developed by Cummins, is a Microsoft Excel-based tool that provides step-by-step approaches for meeting the requirements in ISO 50001 for Energy Review, Energy Baseline, and Energy Performance Indicators (ISO 50001: 2011, § 4.4.3–§ 4.5.5).
- Training materials: Training materials on implementing ISO 50001 and SEP enterprise-wide are available and can be requested through Paul Scheihing of DOE at [paul.scheihing@ee.doe.gov](mailto:paul.scheihing@ee.doe.gov). DOE encourages using a Qualified ISO 50001 Instructor<sup>12</sup> for such trainings.
- DOE Case Studies:<sup>13</sup> These case studies document the experience of industrial companies implementing ISO 50001 and SEP under both “single-site” and “enterprise-wide” approaches.
- Clean Energy Ministerial (CEM) Case Studies: CEM case studies capture the experience of many international organizations implementing ISO 50001 at the corporate level or at individual sites. They are searchable by organization name or “ISO 50001” on their website (see Footnote 5).

## 9. Conclusions

The ISO 50001 standard has been successfully adopted in the industrial sector since its publication, with lots of well-established examples and available implementation resources. These serve as a great foundation for expanding ISO 50001 adoption into the commercial building sector, where it holds tremendous potential. Currently, there is no tracking of individual certifications, so its true uptake in the

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<sup>6</sup> Available at <https://www.energy.gov/eere/amo/getting-started-iso-50001> (accessed on Apr 11, 2017).

<sup>7</sup> Available at <https://betterbuildingssolutioncenter.energy.gov/50001Ready/resources/navigator> (accessed on Apr 11, 2017).

<sup>8</sup> Available at <https://enpi.industrialenergytools.com/> (accessed on Apr 11, 2017).

<sup>9</sup> Available at <https://www.energy.gov/eere/amo/articles/energy-performance-indicator-tool> (accessed on Apr 11, 2017)

<sup>10</sup> Available at <https://www.energy.gov/eere/amo/downloads/energy-footprint-tool> (accessed on Apr 4, 2018)

<sup>11</sup> Available at <https://www.energy.gov/eere/amo/downloads/cummins-energy-review-tool> (accessed on Apr 11, 2017)

<sup>12</sup> Available at <https://www.energy.gov/eere/amo/articles/additional-iso-50001sep-trainers-now-available> (accessed on Apr 11, 2017)

<sup>13</sup> Available at <https://www.energy.gov/eere/amo/business-case-iso-50001-and-sep> (accessed on Apr 11, 2017)

commercial buildings sector is unknown. However, there are published examples of ISO 50001 certifications at the individual building level, multiple building level, and corporate level, among commercial buildings in the United States and the world. This report includes interviews with two such organizations—Aflac (corporate-level certification) and Hilton (full enterprise-wide certification)—to help readers understand the values of their certified EnMS and their implementation approach. It is clear that ISO 50001 EnMS provides tremendous value to commercial buildings, including both energy and non-energy benefits.

The commercial buildings sector has some unique opportunities to benefit from an ISO 50001-conforming EnMS. Many organizations own multiple buildings; combined, their energy consumption aggregates to a very significant total, which presents great opportunities to save. There are also plenty of no-cost/low-cost energy-saving opportunities and a low level of perceived project risks in commercial buildings. In addition, the similarities among energy-consuming systems in commercial buildings make it easier to standardize and scale EnMS across buildings. Considering implementation costs and complexity of ownership and O&M responsibilities, we recommend a “suitable market” (Section 4) within the commercial buildings sector for pursuing ISO 50001 certifications. Organizations can significantly reduce implementation costs using the “enterprise-wide” approach. A number of resources are available for assisting organizations with ISO 50001 implementation, including DOE’s 50001 Ready Program with self-guided tools. It should be noted that implementing a self-declared ISO 50001-conforming EnMS without bearing the cost of third-party certification could be a good goal for some small- to medium-sized commercial building organizations.

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## Appendix – Interviews with Two ISO 50001-certified Companies

LBNL researchers, DOE and Energetics, Inc. had conducted interviews with two commercial building organizations – Aflac and Hilton Worldwide, which had successfully certified to the ISO 50001 standard. The interview notes with Aflac and Hilton are included below, which discuss the driving factors for their organizations, experienced benefits, their implementation approach and recommendation to their peers. The intent is to inform other organizations in the commercial building sector that are considering the ISO 50001 standard for their energy management practices.

### Aflac (U.S. Insurance Company)

Aflac, the leading provider of voluntary insurance sales at the worksite, certified 13 buildings to the ISO 50001:2011 standard in 2013 at their Columbus, GA headquarters. These buildings, on two adjacent campuses, have a combined annual energy spend of approximately 2.5 million dollars. By 2016, the company was able to reduce their energy intensity at site (annual Btu consumption per square foot) by a significant 16.7% compared to when they started implementing ISO 50001 in 2012. In addition to energy savings, the company has gained greater focus on setting energy targets and measuring results due to the transparency and documentation that the standard requires.

Before embarking on the ISO 50001 journey, Aflac had completed a number of quick-win projects and had previously reduced their energy intensity by 40% in 2012 compared to their 2007 baseline. As the company transitioned to resorting to more capital energy projects for energy savings, the ISO 50001 EnMS provided an excellent framework for systematically evaluating such opportunities. The standard-required operational controls also minimized the number of comfort complaints, enabling teams to focus on business priorities. Aflac's senior management is pleased with this achievement and supports programs that promote corporate social responsibility (CSR). The company recommend that having some experience on energy management and ISO management systems will make ISO 50001 implementation smoother.

**Interview Date:** January 27, 2017

**Interview Method:** Conference call

#### Attendees:

##### Aflac:

Doug Brown – Quality Assurance Consultant, who oversees ISO management systems implementations (ISO 50001, ISO 14001, ISO 9001, and ISO 26000)

Rob Holleman, Director of Facilities Maintenance

Alfred Blackmar, VP Facility Support

##### DOE:

BTO: Priya Swamy

AMO: Paul Scheihing, Pete Langlois

##### LBNL: Christine Wu

**Energetics:** Paget Donnelly, Pamela de los Reyes

## Background on ISO 50001 Implementation

### What were the primary drivers that made Aflac pursue ISO 50001?

- The company prioritizes **corporate sustainability and citizenship** as a major employer in Columbus, GA. They take this very seriously.
- In 2006 or 2007, Aflac took a more focused look at how it used and managed energy, and energy reduction efforts. Initially they considered ISO 14001, but determined that their experience with energy management made them ready for ISO 50001, so they pursued 50001 first.
- ISO 50001 was initially **certified in 2013** and recertified in June 2016. Now pursuing ISO 14001.

### What was the scope of your EnMS?

- **13 individual buildings**, split between 2 campuses that are separated by 6 miles. The footprint of each campus is about equal. One campus includes a data center.
- Rough idea of the footprint –
  - Scope covers the owned facilities in Columbus, GA:
    - **1,100,000 sq ft (0.5 million sq ft on each campus).**
    - 30 million kWh of electricity (which has decreased)
  - Current total **energy spend is about \$2.2-\$2.5 million**. Aflac has noticed the energy spend decrease over time. Energy spend is at its lowest point since 2005, despite an approximate 240,000 sq ft. increase in portfolio.
- 2007 is the baseline. In 2016, the **kWh/ft<sup>2</sup> decreased by 50%**— reduced from 44 kWh/ft<sup>2</sup> in 2005 to 21.7 kWh/ft<sup>2</sup> in 2016.
- Centralized building automation system and a business partner helps manage, track and operate the HVAC and lighting systems, which enables centralized programming control and diagnostics on energy usage.

### What are some keys to success? (i.e., please summarize the factors that helped your staff implement the EnMS to achieve energy/cost savings and other benefits.)

- ISO standardizes the way we do business and document progress. It provides better **transparency and documentation**, which is better for team functioning, new staff training and for personnel changes.
- A key to 50001 implementation was **prior experience with ISO 9001** certification. Success with ISO 50001 helped Aflac start with ISO 14001 and ISO 26000.
- ISO 50001 has helped with establishing monthly reviews, and teams are more mindful of how energy use compares to previous year. Factored with weather, Aflac is now greatly skilled at **understanding weather impacts on building**. ISO 50001 “keeps us focused” with setting targets and measuring progress. Within 5% target. The whole team in the facilities group is aware of the energy efforts, and many team members have gone out on their own to look for ways to save energy.
- ISO 50001 helped Aflac become more **focused on efforts to save energy**. The company did several energy-savings projects from 2007-2013 (prior to ISO 50001 certification), but didn’t have the focus and sophisticated visibility into those efforts. With ISO 50001, the company now

does energy reviews, including monthly management reviews that examine performance, what's coming up, and ways to continue driving energy usage down.

- Results of these reviews are rolled up through Doug Brown's level and up to executive leadership. Alfred Blackmar's supervisor is the Senior VP for Business Services, who reports to the President of Aflac. ISO 50001 has visibility up and down the leadership chain on monthly and quarterly basis.

### *Benefits of ISO 50001 Certification*

#### **What made you decide to pursue certification (as opposed to implementing your own EnMS)?**

- Certification provides **additional credibility**—mainly for leadership and is also a significant factor in **CSR reporting**.
- Aflac is among the few U.S.-based insurers on the **Dow Jones Sustainability Index** and has been at least 6 years. ISO 50001 will assist the company in maintaining their place on this listing. Aflac is excited about ISO 14001 because DGSi also ask about it specifically.

#### **To what extent has ISO 50001 participation helped reveal new energy saving opportunities that otherwise would not have been identified?**

- ISO 50001 helped Aflac structure its programs, establishing the goals and targets, which certainly assisted them in looking for opportunities.
- Report to *Carbon Disclosure Project (CDP)* and looking for continued increases in carbon footprint. Forces us to continue to look in ways that we otherwise would not have.
- Energy savings are starting to flatten out, so they will need to look at **investing in more infrastructure to continue progress**.
- **Most improvements were operational**: building automation replaced manual operation of chillers and lights. Much of the early savings were scheduled changes and tweaks and looking at operations of major equipment.
- In recent years, the company started investing in projects, seeking projects with **payback in 48 or less months**. They had good wins with much shorter payback periods. Solar is a good example and they reached an acceptable payback of 56 months. We try to find 4 years or less. They are now beginning to invest in LED lighting seeing some great returns in terms of energy reduction.
- Data center – Of the company's total consumption of ~23 million kWh, the data center accounted for 4.5 million kWh of that amount. The actual equipment 2.7 million kWh of the data center consumption.

#### **Are there any non-energy benefits that Aflac saw due to ISO 50001 participation (e.g., building comfort, etc.)?**

- The facility help desk received **fewer hot and cold calls**. In 2007 when they started focusing on energy efficiency, several hot and cold calls were received during the day. Those calls have reduced through Aflac's partnership with HVAC provider and Aflac's own effort to adjust operating temperature, bands, sequences of operations and schedules. They still get hot and cold calls, but they are now a small fraction of what they were. This **enables facility staff to use their time to focus on other priorities**.

### What has been your management's reaction to the ISO 50001 certification and results?

- They have been **very pleased reporting the success of our programs** up to the sustainability committee and to the Board of Directors.

### How long has Aflac used Energy Star?

- In 2006 and 2007, Aflac began using Energy Star and tracking. By the time they did ISO 50001, they already received recognition for having several buildings certified to Energy Star. Our data center got Energy Star certification (9th in the U.S.).
- When Aflac started using Energy Star, the total portfolio score was in the 40s. **"It's been fun to watch the score rise"** and are now at 82 and attribute a lot of that improvement to ISO 50001.

### Promoting ISO 50001 / Future Plans

#### Do other insurance companies care about ISO 50001? If not, what would make them consider ISO 50001?

- Other insurance companies share information about their sustainability activities, however, we are not certain if many others are referencing the ISO standards. As these companies begin to ramp up their CSR, consumption will be a key element and it would not be surprising if ISO 50001 or ISO 14001 become more visible in their statements.
- Moving forward, it would be good to see more of **a demand from the public** to do business with companies that more **socially responsible** prove themselves to be stewards of resources.

#### Do you publicize your ISO 50001 certification to your customers? If so, how?

- Aflac produces and publishes on Aflac.com its annual CSR report wherein certifications and programmatic sustainability procedures and results are reported.

#### Do you plan to pursue recertification or expand ISO 50001 in other ways?

- **Recertified** to ISO 50001 in June 2016 through SAI global. A 3-year contract is in place for surveillance audits through 2019.
- **Corporate energy reduction goals through 2020** on annual reduction of consumption.
- Not planning to expand to other locations: All Aflac **corporately operated space is in leased** space that they do not have control of managing.

#### What were your challenges?

- Prior experience with ISO 9001, Energy Star, and internal energy projects were very helpful. The ISO 50001 implementation process was **probably smoother and less effort than it would have been if ISO 50001 was the first thing they implemented.**
- The Certification Body, SAI Global was getting their ANAB audit during Aflac's ISO 50001 audit. However, Aflac was very personally **pleased and surprised at the entire audit process.**



## Hilton Worldwide (Global Hospitality Company)

In 2014, Hilton became the first global hospitality company to achieve ISO 50001:2011 certification across its entire portfolio of owned, managed and franchised properties. Hilton's certified portfolio of more than 5,100 properties had a combined energy footprint of nearly 45 million MBtu in 2016.

Energy tends to be a hotel's second highest operating cost after labor, and the company has a long history of managing energy consumption. In searching for an overarching energy strategy, Hilton evaluated multiple recognized "green building" programs and identified ISO 50001 to be the best fit.

Among the many benefits of the standard, Hilton highly appreciated the international aspect of ISO 50001 and its focus on continuous improvement. ISO 50001's basis in business processes enabled it to be integrated into Hilton's proprietary LightStay™ Corporate Responsibility reporting software, which all properties are required to use, thus providing a very efficient approach given Hilton's capital light operating model.

By 2016, Hilton had reduced energy use intensity by nearly 19% against a 2008 baseline. This is a very significant achievement on energy savings given that the company has been working on energy management since 1970s and have largely harvested the "low-hanging fruit." Hilton structured its ISO 50001 implementation team with six existing "Central Office" members and a team of 3-5 existing staff at each property site. The company recommends using a robust and centralized energy consumption tracking system and clearly communicate importance and expectations to all employees.

**Interview Date:** October 27, 2017

**Interview Method:** Phone call

**Interviewee:** Maxime Verstraete, Vice President, Corporate Responsibility & ADA Compliance (Hilton)

**Interviewer:** Jingjing Liu (LBNL)

### *Background on ISO 50001 Implementation*

#### **Was Hilton involved in energy management prior to pursuing ISO 50001?**

Since the early 1970s we have engaged in energy management, beginning with the creation of energy management manuals. We have continued to focus on saving energy over the years but lacked a company-wide overarching strategy.

Hilton Hotels Corporation and Hilton International each had its own reporting system before the two companies merged (EnergyWatch launched in 2002 and Hilton Environmental Reporting launched in 2004). The companies merged in 2005, and the HEAT (Hilton Environmental Analysis and Tracking) system was created, taking merits from both earlier systems. HEAT was used to record energy, water and waste for all properties, taking into consideration the hotel profile.

In 2008, the company set five-year sustainability goals to achieve by 2013: to reduce energy consumption and carbon emissions by 20%, waste by 20%, and water consumption by 10%. In 2010, HEAT evolved into our proprietary corporate responsibility performance measurement software platform, LightStay. We were enabled to start tracking 200 sustainability-related

metrics, including energy, with relevant variables taken into account (such as heating and cooling degree days, occupancy, and floor area).

With the LightStay platform established and having made measurement of sustainability metrics a brand standard starting in 2009, Hilton achieved ISO 9001 (quality management) and 14001 (environmental management) certifications in 2011, and was fully recertified to both standards in 2014. We were also certified to ISO 50001 during the same 2014 third-party audit. With these certifications, Hilton Worldwide was one of the first multinational organizations to certify its entire system globally, and we achieved one of the largest-ever volume triple certification of commercial buildings.

#### **Drivers for ISO 50001 participation?**

We became interested in ISO 50001 as soon as it was published in 2011. The 2012 promulgation of the Energy Efficiency Directive by the European Commission strengthened the business case to certify, because under the EED our properties are required to either perform an energy audit every five years or be ISO 50001 certified. ISO 50001 offered a stronger return on investment and the opportunity to drive global improvement. We officially started implementing ISO 50001 in 2013.

#### *Benefits of ISO 50001 Certification*

#### **Did Hilton consider any other building energy certification programs (e.g., LEED and ENERGY STAR) available on the U.S. and global market? If so, what was the unique value that Hilton found from ISO 50001?**

Back in 2009, we were looking for a suitable company-wide energy management program. We considered multiple options including ISO 50001, LEED, Green Seal, and others. ISO 50001 turned out to be the best fit for us because it is international and process-based, with a strong focus on continuous improvement. It was much easier to implement across a varied global real estate portfolio like ours, given that our properties include hotels, convention centers, and resorts of many sizes.

We are also highly franchised with over 85% of our global footprint operated by third party management companies. Therefore, we rely heavily on our Brand Standards to ensure quality and guest satisfaction. We were able to implement ISO 50001 with goals and actions through LightStay, use of which is required in the Brand Standards. To take our energy management a step further, we also implemented Superior Energy Performance (SEP) modeling in LightStay through partnership with the U.S. Department of Energy (DOE) and so far have six hotels SEP-certified (SEP requires ISO 50001 certification). We were proud to be the first company to certify a commercial building to these standards back in 2015.

#### **Besides energy savings and GHG reductions, were there any significant non-energy benefits to Hilton?**

Yes. Being able to prove and document our energy savings to comply with the Energy Efficiency Directive from the European Commission provided a return on investment (ROI) for us. During the ISO 50001 journey, we also developed and strengthened tangible partnerships, such as our partnership with DOE. We have found that our ISO 50001 certification has enabled us to

strengthen our leadership position, while also increasing the value proposition for our energy management system and for investing in new functionalities (e.g., modeling, checks, and alerts) in our LightStay platform, to further drive ISO 50001 compliance and energy performance.

In addition, from a management perspective, ISO 50001 as a recognized program helps us better manage risks when it comes to utility costs in light of fluctuating energy costs. It was also important to stay ahead of legislation, and ISO 50001 provided a route to do so. For practical purposes, documenting “how we do things” is a great best practice for a large company like ours, and third-party certification provides additional oversight. ISO 50001 also enables us to look at energy management from a system perspective. It is a very beneficial shift from a project-by-project or “budget line” approach to a deeper dive.

This year, we made the Dow Jones Sustainability Index (DJSI) for the first time and ISO 50001 has contributed to achieving this. Being listed by DJSI provides many benefits including strengthening our corporate social responsibility platform, responding to consumers’ and investors’ needs, and improving employee engagement. About half of our workforce are Millennials – they increasingly care about “doing the right thing” when they select employers. Because we are a publically traded company, it is important to recognize that majority of the investors today will not invest in a company if it is not tackling societal issues. As a company that heavily relies on our brand, we have to make sure that our brand attracts consumers as well as hotel developers. This is extremely important.

### *Implementation Approach*

#### **How did Hilton implement the “Central Office” and what are the Team Members?**

We implemented the ISO 50001 through a six person “Central Office” team within the existing management structure. Members of this core team consist of myself (Maxime), one person from Environment & Sustainability, and leaders of the Regional Property Management teams (Americas, Middle East & Africa, Europe, Asia Pacific). We did not need to make any new hires to implement ISO 50001.

Other internal functions that were involved in ISO 50001 implementation are Quality, Guest Satisfaction, Property Operations, Engineering, Brand, Legal, and Supply Chain. Our certification body (DEKRA) was also an important stakeholder. As a large company, we benefitted from having all of these centralized functions at the corporate headquarter to provide oversight and manage the ISO 50001 requirements centrally.

#### **At each individual hotel site, what does a typical ISO 50001 implementation team look like?**

It typically consists of 3-5 existing Team Members, including the General Manager and managers of major functions (e.g., Housekeeping, Engineering/Maintenance, Food Services). However, besides the implementation team, every Team Member has a role in achieving our goals when it comes to energy efficiencies.

**We have seen manufacturing organizations using a two-level top management structure in their ISO 50001 system, one at the corporate level and one at the local site level. Does Hilton use a similar structure?**

No. Our top management is at the corporate level alone. During ISO 50001 Management Reviews, our top management will look at energy data at all sites in aggregate, such as by region, by brand, etc. Management at each site only participate in the audit process.

**Hilton achieved ISO 50001, and ISO 9001 and ISO 14001 re-certifications simultaneously in 2014. Was there a full integration among the three management systems? If so, in which areas (e.g., processes, procedures, platforms/tools, and teams) did Hilton find make sense to integrate?**

Yes, it was a full integration. Our quality assurance team monitors compliance with the requirements of all three ISO standards as part of our Brand Standard. We manage both ISO 50001 and ISO 14001 through LightStay.

**Did Hilton use the same team that implemented ISO 14001 for ISO 50001? Did you have to make new hires and/or train your staff for the implementation?**

The two standards share the same implementation team. We have a strong energy management foundation considering the cost to our overall business so we did not have to include new Team Members for ISO 50001.

Instead of training, we really just needed to raise awareness across a very large employee base (over 360,000 Team Members across corporate, managed and franchised hotels). For this purpose, we launched multiple engagement campaigns and leveraged our community engagement activities. Our mandated that all properties (including franchises) participate in LightStay and record all of their energy projects was also very beneficial.

### *Promoting ISO 50001*

**How can DOE to better assist the commercial building sector implementing ISO 50001?**

We have recommendations in a few areas, as follows:

- Provide guidance documents to give advice on how to communicate simply to different levels of the organization what ISO 50001 is and how employees can be involved.
- Develop more case studies of how other organizations have implemented the standard, what challenges they faced, and how they overcame those challenges.
- Provide more information on the benefits that being certified has brought to these example organizations.

**In your opinion, how can a commercial organization best get started with ISO 50001? What are the essential elements (e.g., management involvement, communication, organizational considerations, prior experience with energy or environmental projects) required to successfully implement and certify to ISO 50001?**

We can recommend the following:

- Ensure that they have a robust system to track energy consumption and raise alerts when consumption deviates from expected boundaries, so that corrective action can be taken. This could be managed on a site-by-site basis, but for a multi-site organization, it would be better to have something visible centrally.
- Train team members on energy management – this can be basic but should include why it is important (both internally to the organization and also from a global perspective if applicable) and tips on how they can have an impact in their day-to-day roles.
- Provide clear communication lines to business units to ensure that people understand the requirements.